PESTS NOT KNOWN TO OCCUR IN THE UNITED STATES OR OF LIMITED DISTRIBUTION, NO. 44: BLACK PARLATORIA SCALE

Prepared by V. L. Blackburn* and D. R. Miller†

Pest

BLACK PARLATORIA SCALE
Parlatoria ziziphi (Lucas)

Order: Family

Homoptera: Diaspididae

Economic Importance

The black parlatoria scale has long been considered one of the major pests of citrus in certain areas. It is reported as important in the following countries: China (Chekiang Province and Taiwan) (Chen 1936, Chang and Tao 1963), Egypt (Hosny 1943), Iran (Zoebelein 1966), Italy including Sicily (Costantino 1955, Quayle 1914), Libya (Martin 1954), Nigeria (Boboye 1971), and Tunisia (Benassy and Soria 1964). Talhouk (1975), in his treatment of the citrus pests of the world, lists black parlatoria scale as economically important in Algeria, Morocco, Tunisia, and Southeast Asia; he lists it as causing some damage in Greece, Italy, Spain, Israel (See General Distribution), Egypt, and South Africa. He noted that in some countries the scale may not be considered a serious pest, but populations occasionally become a problem in localized areas.

Although the pest sometimes causes dieback of twigs, premature drop of fruit and leaves, and deformation of fruit, it is most serious as a fruit contaminant. Generally, the scale is so firmly attached to the fruit that it cannot be removed, causing rejection in most fresh fruit markets (Chang and Tao 1963).

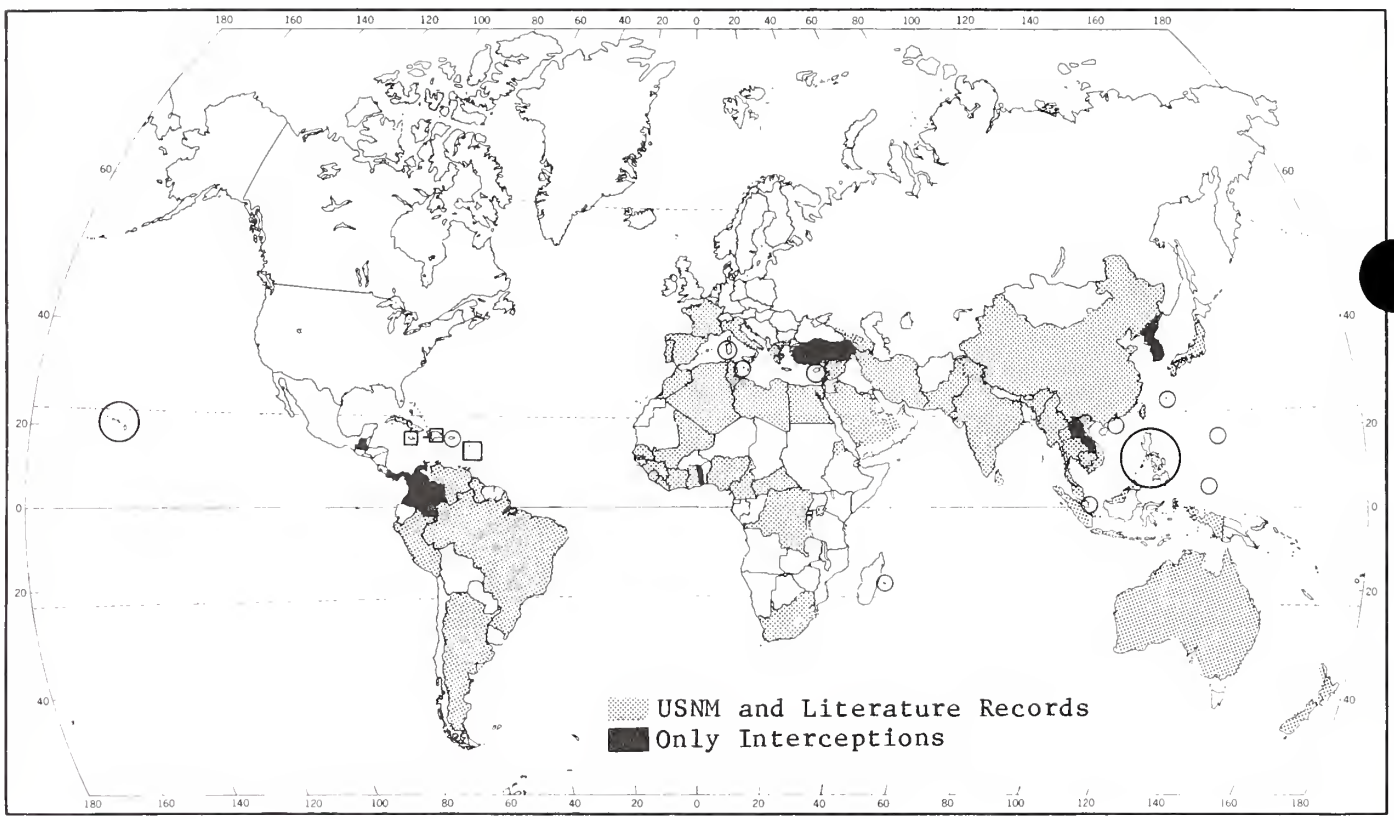
Hosts

This scale insect feeds almost exclusively on citrus and is rarely recorded on other hosts. We have examined specimens from Carissa, Citrus, Ligustrum, and Severinia. It also has been reported on Codiaeum, Cymbidium, Poncirus, Ziziphus (Borchsenius 1966), and Phoenix sp. (Dekle 1976). We suspect that the records on Cymbidium and Codiaeum are based on misidentifications of the scale. Mr. Sueo Nakahara, SEL, studied the apparent erroneous host records for this scale and discovered the following (personal communication). In the case of one record on Carissa, Mr. Ray Gill, California Department of Food and Agriculture, Sacramento, examined dry material of

* PPQ, APHIS, USDA, Room 1, Bldg. 003, BARC-West, Beltsville, MD 20705

† Systematic Entomology Laboratory (SEL), Insect Identification and Beneficial Insect Introduction Institute (IIBIII), Agricultural Research Service (ARS), USDA, Room 1, Bldg. 003, BARC-West, Beltsville, MD 20705

the scale on its host and discovered that the plant had been misidentified and was actually a species of Severinia. The record on Ligustrum is based on a collection made by G. F. Ferris in China. Examination of the dry material by Ray Gill revealed that the collection contained leaves of both Ligustrum and an unknown member of the family Rutaceae. Morrison (1939), Mamet (1949), and Dekle (1976) also questioned the validity or host records outside of the family Rutaceae. At this time, it seems best to assume that black parlatoria scale occurs only on rutaceous hosts (Citrus, Poncirus, and Severinia) until other records can be positively confirmed.



Parlatoria ziziphi distribution map prepared by Non-Regional Administrative Operations Office and Biological Assessment Support Staff, PPQ, APHIS, USDA

General Distribution

We have examined specimens from the following locations. These specimens are deposited in the Collection of the United States National Museum of Natural History, Beltsville, MD.

AFRICA - Algeria, Cameroon, Egypt, The Gambia, Libya, Morocco, South Africa, Tunisia, and Zaire; ASIA - Burma, China (Fukien and Kwangtung Provinces and Taiwan), Hong Kong, India, Indonesia (Java and Sumatra), Iran, Israel (Dr. Yair Ben-Dov, Department of Entomology, The Volcani Center, Bet-Dagan, Israel, who is very familiar with the scale insects of citrus, has neither seen nor heard of any P. ziziphi infestations in Israel, other than those reported in the literature and deposited in the USNM, personal communication 1984), Japan including Okinawa, Kampuchea, Lebanon, Malaysia, Philippines, Saudi Arabia, Singapore, Soviet Union (Asiatic Caucasus), Syria, Thailand, and Vietnam; EUROPE - France, Greece, Italy, Malta, Portugal, and Spain; OCEANIA - Caroline Islands (Palau, Ponape, Truk), Guam, Hawaii (Oahu), and New Zealand; SOUTH AMERICA - Guyana, Peru, and Venezuela; and WEST INDIES - Cuba, Dominica, Haiti, and St. Croix.

Additional records taken from the literature and from plant quarantine records follow. Plant quarantine records (Those cited as U.S. Department of Agriculture) should be used considering the following factors. It is important to realize that the area of origin of quarantine records are subject to error. It is not always possible to determine if a product originated in the country of purchase or if an importer is reporting the true origin of a cargo. Therefore, we have included only plant quarantine records that are substantiated by at least two independent interceptions.

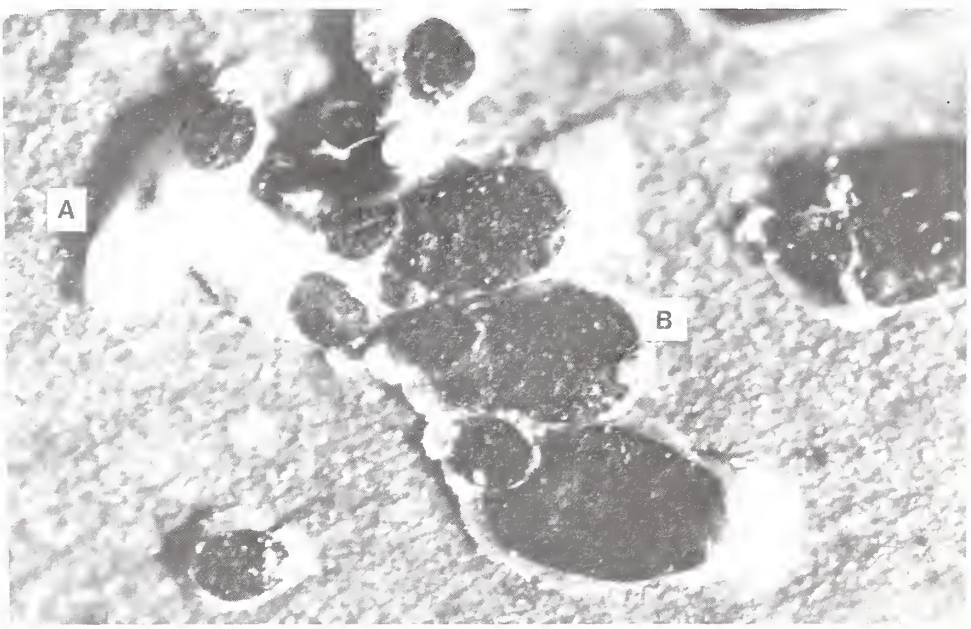
AFRICA - Central African Republic, Ethiopia (Eritrea), Ghana, Guinea, Ivory Coast, Liberia, Mali, Mauritius, Nigeria, Senegal, and Sierra Leone (Commonwealth Institute of Entomology 1964), and Togo (U.S. Department of Agriculture 1979-1982); ASIA - Bangladesh (U.S. Department of Agriculture 1979-1982), China (Chen 1936, Gressitt and Djou 1950, Ferris 1950), Cyprus (Commonwealth Institute of Entomology 1964), Korea, Laos (U.S. Department of Agriculture 1979-1982), Malaysia (Sabah), Pakistan (Commonwealth Institute of Entomology 1964), Sri Lanka (McKenzie 1945), and Turkey (U.S. Department of Agriculture 1979-1982); EUROPE - Greece (Crete), Italy (Sardinia and Sicily) (Commonwealth Institute of Entomology 1964); OCEANIA - Australia (Commonwealth Institute of Entomology 1964), Hawaii (Hawaii, Kauai, Maui, Molokai) (Nakahara 1981), New Guinea (West Irian) (Commonwealth Institute of Entomology 1964); CENTRAL and SOUTH AMERICA - Argentina (Commonwealth Institute of Entomology 1964), Brazil

(Fonseca 1978), Colombia, Guatemala, and Panama (U.S. Department of Agriculture 1979-1982); WEST INDIES - Barbados, Dominican Republic, Jamaica (U.S. Department of Agriculture 1979-1982), Puerto Rico (Nakahara and Miller 1981), and Trinidad (U.S. Department of Agriculture 1979-1982).

Characters

ADULTS - Female scale cover (Figs. 1, 2F). Length 1.25-2.00 mm, opaque black, rectangular with rounded angles. Dorsum with usually 2, rarely 3, longitudinal ridges. Principal component of cover large, black second-instar exuviae. First-instar exuviae black, located near anterior end of cover. Fringe of white wax around perimeter of exuviae, especially posteriorly. Ventral scale cover well developed, light brown or white. Violet eggs in two longitudinal rows between dorsal and ventral scale covers.

(Fig. 1)



Parlatoria ziziphi: A. Male cover. B. Adult female cover, large, black with narrow band of white wax at posterior end.

Male scale cover. Length about 1.00 mm, white, elongate. First-instar exuviae brown or black, situated at anterior end of cover (Ebeling 1959, McKenzie 1945).

Diagnosis of adult female (Fig. 2). Body oval (Fig. 2G), pygidium semicircular (Figs. 2A, 3). Pygidial lobes, median to third pairs, about same size and shape, each longer than wide, constricted basally, notch on each side, basal sclerosis; median lobes separated by space equal to or wider than greatest width of median lobe, nearly parallel axes, occasionally slightly divergent; second lobes slightly divergent; third lobes obviously divergent; fourth lobes (Fig. 2B) smaller than others, shorter than adjacent plates, in form of acute, sclerotized spur, 1 or 2 lateral notches, 0 or 1 medial notch; fifth lobe difficult to distinguish from adjacent plates, membranous or slightly sclerotized. Plates (Fig. 2E) from segments 2 (rarely 1) to 8, 2 between median lobes, 2 between median and second lobes, 3 between second and third lobes, 3 or 4 between third and fourth lobes, 4 to 7 between fourth and fifth lobes. Gland tubercles usually absent from head and prothorax, occasionally 1 on prothorax near earlike lobe, 3 to 9 on mesothorax, 4 to 9 on metathorax, 1 to 5 on first abdominal segment. Macroducts restricted to marginal (Fig. 2C) and submarginal areas, 1 or 2 between median lobes, 9 to 21 submarginally from abdominal segment 2 or 3 to area anterior of median lobes. Prosomatic, earlike process (Fig. 4) on margin laterad of anterior spiracle. Anterior spiracles (Fig. 2I) each with 2 to 4 quinquelocular disc pores. Perivulvar pores absent from median group, 2 to 10 (Fig. 2D), in each anterolateral group, 4 to 11 in posterolateral group.

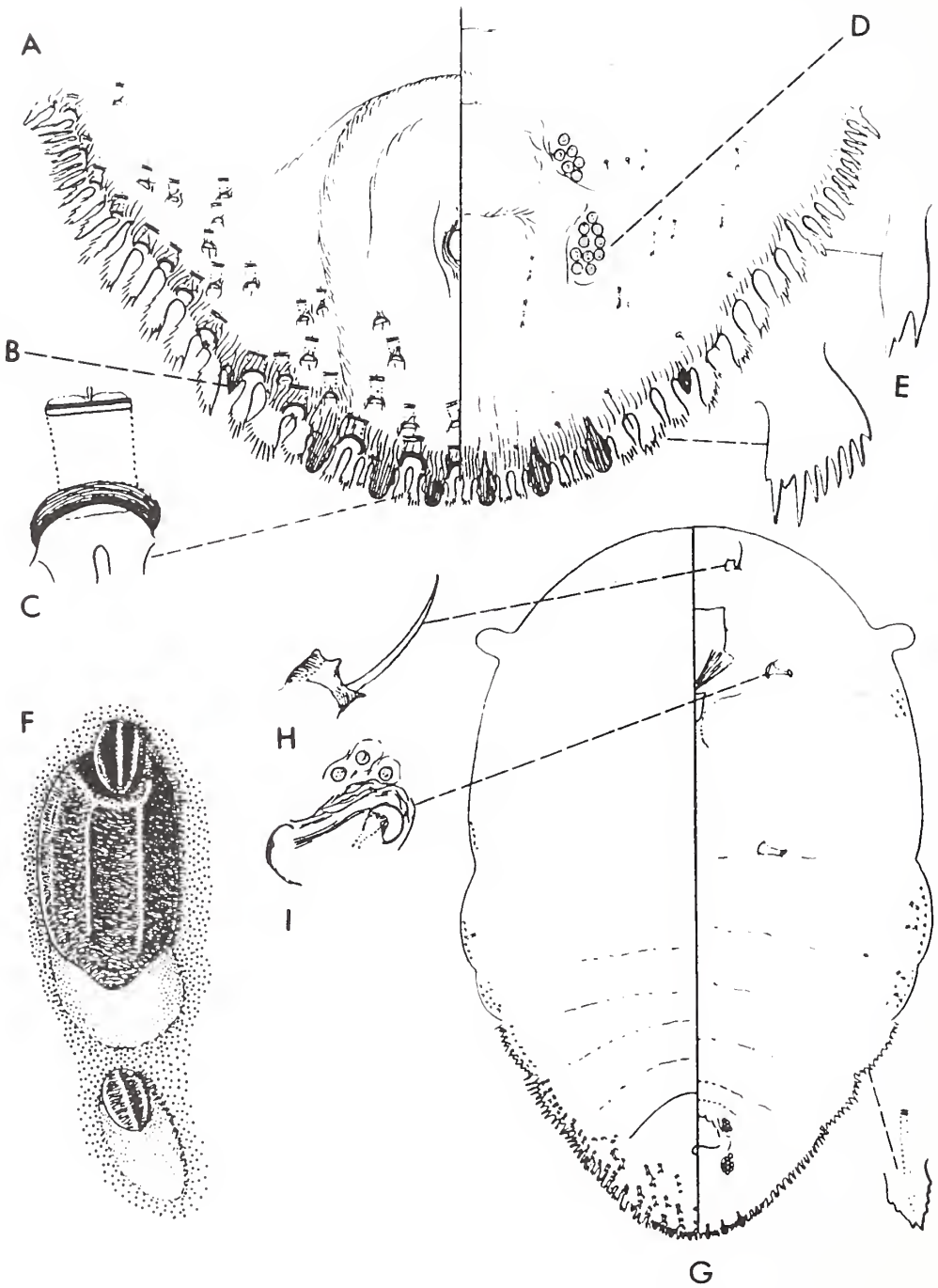
The above description is a modification of the treatment of Takagi (1969).

P. ziziphi can be distinguished from all other species of Parlatoria by the earlike, marginal, prosomatic lobes laterad of the anterior spiracles; the rectangular, black scale cover; and the white wax fringe that surrounds the posterior half of the cover.

Characteristic Damage

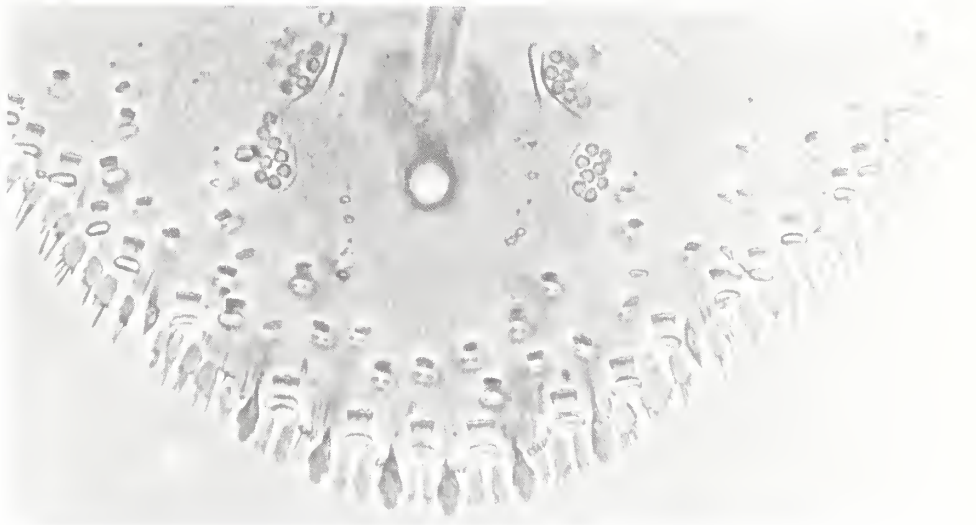
Heavy infestations of this scale cause chlorosis and premature drop of leaves (Clausen 1933), dieback of twigs and branches (Chang and Tao 1963), stunting and distortion of the fruit (U.S. Department of Agriculture 1960), and fruit to drop before it is mature (Quayle 1914). Perhaps the most characteristic damage is the virtually unremovable scale cover on the fruit.

(Fig. 2)



Parlatoria ziziphi adult: A. Pygidium, dorsal and ventral views. B. Pygidial lobe 4, dorsal view. C. Marginal macroduct, dorsal view. D. Perivulvar pores, ventral view. E. Plates, ventral view. F. Scale covers, female and male. G. Body, dorsal and ventral views. H. Antenna, ventral view. I. Anterior spiracle with disc pores, ventral view (From McKenzie 1945).

(Fig. 3)



Parlatoria ziziphi adult female pygidium.

(Fig. 4)

Parlatoria ziziphi adult female prosomatic, earlike process.

Detection Notes

The unauthorized importation of nursery stock in the plant family Rutaceae poses the highest risk of establishment of P. ziziphi into new areas. Title 7, Part 319.19, of the Code of Federal Regulations prohibits, because of other pests, the entry of citrus nursery stock into the United States. Citrus nursery stock may, however, be imported under Departmental permit but must be free of all exotic plant pests.

1. Examine fruit and attached stems and leaves for small black specks that could be female scale covers.

2. When forwarding material for identification, submit the scales attached to the leaf, twig, or peel of the fruit. Make sure the specimens are dead before forwarding.

3. Mount specimens on a slide and examine with a compound microscope for positive identification.

Biology

In the Levante region of Spain there are three to five generations each year. All stages of development can be found throughout the year. The adult female lays from 8 to 20 eggs which may serve as the overwintering form when they are laid in the fall (Gomez Clemente 1943). In the Asiatic Caucasus of the Soviet Union, the scale produces two and one-half generations each year, and overwinters in the second instar (Borchsenius 1950). In Taiwan, there are up to seven generations each year; a generation requires about 42 days to develop from June to August and about 93 days during cooler weather. Depending on the season, the egg stage lasts from 2 to 4 days, the first instar from 6 to 13 days, the second instar from 13 to 30 days, and the adult female lives from 11 to 24 days. The oviposition period lasts from 7 to 18 days (Chang and Tao 1963). There are five generations each year in Sicily, and the complete life cycle takes from 30 to 40 days under favorable conditions (Monastero 1962). A generation requires 75 to 80 days in Tunisia during warm periods and up to 160 days during cool periods (Benassy and Soria 1964).

Leaves are the preferred feeding site, but fruit and branches also are attacked. Scale covers are found on both surfaces of the leaves. This species is somewhat unusual in that it is so tightly attached to the host that it is nearly impossible to remove without destroying the substrate and the scale (Chang and Tao 1963).

Natural Enemies

The following natural enemies have been recorded from this pest. Parasites: Insecta, Hymenoptera -- Aphelinidae - Aphytis aonidiae (Mercet) (Nikolskaya and Jasnosh 1966), A. chrysomphali (Mercet), A. proclia (Walker) (Chang and Tao 1963), Aspidiotiphagus citrinus (Craw) (Monastero 1962), and A. lounsburyi (Berlese and Paoli) (De Santis 1979). Encyrtidae - Arrhenophagus chionaspidis Aurivillius (Annecke and Prinsloo 1974). Mymaridae - Alaptus minutus Dozier (Dozier 1932), Arescon auleurodiphaga Risbec, and Mymariella parlatoreae Risbec (Herting and Simmonds 1972).

Fungi, Ascomycetes -- Hypocrella aleyrodis (Webber) Sawada, Nectria aurantiicola (Berkeley and Broome) Petch (=Sphaerostilbe aurantiicola Berkeley and Broome), N. flammea (Tulasne) Dingley (=Sphaerostilbe coccophila Tulasne), Podonectria aurantii (Hohnel) Petch (=Ophionectria tetraspora Miyabe and Sawada) (Chang and Tao 1963), Podonectr coccicola ia (Ellis and Everhart) Petch (=Ophionectria coccicola Ellis and Everhart) (Chang 1970), and Sphaerostilbe fujikuroi Sawada. Fungi Imperfecti -- Aschersonia aleyrodis Webber, A. marginata Ellis and Everhart (Chang and Tao 1963), Fusariu juruanumm P. Hennings (=Pseudomicrocera henningsii (Koord.) Petch (Chang 1970), Verticillium lecanii (Zimmermann) Viegas (=Cephalosporium lecanii Zimmermann), and V. parlatoriae Sawada (Chang and Tao 1963).

Predators: Insecta, Coleoptera -- Coccinellidae - Chilocorus bipustulatus (Linnaeus) (Monastero 1962), C. nigritus (Fabricius) (Herting and Simmonds 1972), Exochomus quadripustulatus (Linnaeus) (Monastero 1962), Lindorus lophanthae (Blaisdell) (Herting and Simmonds 1972), Orcus chalybeus Boisduval (Wilson 1963), and Pharoscymnus taoi Sasaji (Chiu 1979). Nitidulidae - Cybocephalus flaviceps Reitter (Herting and Simmonds 1972).

The impact of natural enemies on the black parlatoria scale has not been studied extensively. Aspidiotiphagus citrinus caused up to 20 percent parasitism in Tunisia (Benassy and Soria 1964) and 40 percent in Sicily (Monastero 1962). In Morocco, Aspidiotiphagus lounsburyi parasitized about 20 percent of the population (Smirnoff 1952). Because these are general scale parasites, it is unlikely that they will be effective biological control agents by themselves.

Considerable caution should be exercised when using the above list of natural enemies since it is based solely on literature records. We believe that some of the records are based on misidentifications of the natural enemies or the scale. In

several instances, natural enemies have been reared from host material infested not only with the black parlatoria scale but also with other herbivorous contaminants.

Acknowledgments

We give special thanks to A. Y. Rossman, Mycology Laboratory, Plant Protection Institute, ARS, USDA, and R. D. Gordon, SEL, IIBIII, ARS, USDA, for checking and correcting names of fungi and coccinellids, respectively. We thank S. Nakahara, M. B. Stoetzel, and J. M. Kingsolver, SEL, for reviewing and criticizing the manuscript. We also thank M. Kosztarab, Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA, for his comments. We appreciate the time that each of these scientists has taken to help us with this publication.

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